

SyncWare News

The journal for electronic
and other technical
applications of T/S
computers

Volume 2 Number 3

Jan.-Feb. '85

Another amazing year has passed and we have seen a number of computer companies bite the big one, as well as a number of computer related publications. Syncware News is now firmly planted and has every intention of "sticking around." We thank all of you for your patience as we evolve and mature. With Volume 1 finished and out of the way, we should now be able to get back on our regular schedule and stay there.

Speaking of evolving and maturing, Sir Clive unveiled his new electric car, which has been described as an overgrown bicycle (three wheeler with a 20 mile range) and demonstrated a new wrist watch radio and the flat screen TV, of which the latter two may be available here in the near future. The QL, as of January 21, 1985, is still being held up by the FCC, for some undisclosed reasons. Sinclair Research spokesperson, Mary Reinman says that they are hopeful for a February release, with shipments to follow in one to two months. The QL did receive a favorable response at a recent electronics show.

AERCO Disk Drives

On the home front, Aerco has announced their disk drive interface, which will have an extra 64K of memory (cartridge bank) for you to use (see more details inside). CPM 2068 should follow soon, which would enable file transfer between other types of CPM computers (that can read the standard IBM 3740 disk format) by disk, which is much cheaper than by modem. We hope that the contents of this issue will inspire software that will use the full 192K byte capability of the 2068.

The TS2192 Computer

The greatest part of this announcement is that if you own a 2068, then you don't have to buy another computer! However, nothing is for free. It does require converting a 1000 64K rampack, of which we show the conversion for one. As details become available, we will show the conversions for others. We expect to see 2068 ram addons sometime in the near future though. Ray Kingsley's article gives the machine code "how to's" to access this extra memory, but he promises that as soon as he takes a course on how to program in Basic, he will enlighten us in this aspect of "extra memory perception."

Spectrum Software

There is just a ton of excellent Spectrum software from games to a floating point compiler. You can get this software from any number of suppliers in this country. With the Pound slipping in price, the cost of Spectrum programs is, relatively speaking, very low. This differential may help justify the acquisition of a Romswitch or a Chameleon.

Microdrives!

Zebra Systems has the Sinclair microdrives running on a 2068 (with a Spectrum ROM). They should have a bus conversion out soon for attachment of those and other Spectrum peripherals.

FOR YOUR SUPPORT

This column announces any software or hardware that is new or otherwise untested by us. If you have something of interest, send us a description of your product. We advise readers to send a SASE, as a courtesy, to the individuals or companies, for further information.

Barry Carter, PO Box 614, Warren, MI 48090, has a 30 page, full size manual for using the Smart II software with the 2068 and 2050 modem. It explains the information in English (not computerese), gives examples, hints, etc. \$5.00.

Aerco, PO Box 18093, Austin, TX 78760, (512) 451 5874, has a smart Centronics printer interface for the 1000 that can autoboot your disk system, set ramtop and disable the Memotech control characters in some software. \$99.00+\$3.00s+h.

Zebra Systems, 78-06 Jamaica Ave., Woodhaven, NY 11421, (718) 296-2385, has a Koala Graphics Tablet for the 2068. It allows you to draw Hi-res pictures, intermix text, connect analog joysticks and more. Tablet, interface and software comes to you for \$89.95+\$3.00s+h.

Pete Petri, 11707 Orsinger Lane, San Antonio, TX 78230, (512) 696 1109, has rewired keyboards with up to 90 keys for both 1000 and 2068 computers. He has a PC board that will shift all the shifted keys to new keys, and also has a Video driver with an inverse video switch for the 1000. No prices were included with the literature, but as I recall, the cost was reasonable.

JRC Software, PO Box 448, Scottsburg, IN 47170, (812) 752-6071, has a 2068 Integer Compiler and Two Pass Assembler on one tape for \$24.95. Also available is the 1000 Incredible Super Tape, which contains 45 programs for \$24.95.

Chia-Chi Chao, 73 Sullivan Dr. Moraga, CA 94556, has Vocabuilder, a vocabulary learning program for the 1000, 16-48K RAM \$7.95+\$1.00s+h. Also available is a Byte-Back Modem, seldom used, exc. cond. for \$109.95 or offer, plus free Vocabuilder.

Poretsky & Poretsky, Inc., 521 Argyle, Brooklyn, NY 11218, (718) 469 5948, has Spec-tax for the 2068. It is designed to help with the 1985 taxes. It will help prepare the 1040, most of the regular schedules and help you decide if you should itemize, average, etc. Quantity prices available. \$16.95ppd.

D. Lipnski Software, 2737 Susquehanna Rd., Roslyn, PA 19001, (215) 572 6812, announces a new Software Buyers Guide, with over 800 software titles, 100 booktitles and 100 hardware items and more. It is in a 3 ring binder and will have updates. \$20.00ppd., foreign add \$1.50 surface or \$5.00 air. Price includes first update.

K. D. Lewis, Box C-6, 767 Hopetown Rd., Chillicothe, OH 45601, has a book containing a number of numerical algorithms for science and engineering types. SUM (Small User's Math) is a compendium of programs that were mainly written and tested on a TS1000. \$15.00 per copy.

American Surplus Trading, 62 Joseph St., Moonachie, NJ 07074, has TS1000 computers without power supplies for \$14.95, guaranteed to work. They also have 2040 printers for \$14.95 sold as is, but they include a 24V. transformer. Leonard Holmes of Williamsburg, VA, sent this in saying that his 2040 printer worked. The transformer he received had 5 and 24 volts on it, but it needed wires, a plug and a housing.

Toronto Software World, PO Box 84, Agincourt, Dept. 3, Ontario, Canada M1S 3B4, has a catalog for ZX81, 2068 and Spectrum conversions. Included in the catalog is Forty Niner, a (software) Hi-res ZX81 game which is available for \$18.95 Canadian.

John Oliger Co., 11601 Whidbey Dr., Cumberland, IN 46229, has an assortment of 1000 and 2068 PC board kits. These include Centronics parallel printer interfaces, 2764/27128 eeprom programmers, expansion boards, cartridge boards, 64K boards, their associated parts kits and more. Send for his catalog.

Rick Munday, Box 4838, APO, NY 09286, has access to a variety of Spectrum programs, many of which are in or have instructions in Spanish. Get in touch with him for more information. Most of the titles are available for about \$15.00.

A.F.R. Software, 1605 Pennsylvania Ave. 204, Miami Beach, FL 33139, (305) 531-6464, has accounting templates for its ZX-Calc program which will allow a small business to prepare the ten most fundamental financial reports. \$8.00 for listing, \$19.95 for cassette+\$1.50s+h.

Sum-ware, 810 Mammoth Rd., Alden, NY 14004, (716) 547-2273, announces the opening of their Timex/Sinclair Computer Store. They also have a new catalog with lower prices. Send a LSASE and double stamp for more information.

Al White, 308 18 1/2 Ave. SW, Rochester, MN 55902, has Wizard, a graphic Dungeon and Dragons type game for the 1000, which is available for \$5.00.

WMJ Data Systems, 4 Butterfly Dr., Hauppauge, NY 11788, has a new catalog of software available, which covers quite a bit of ground including accounting and data base, games like Voice Chess and utilities. QuarTerS, a publication geared toward Basic usage, will be published four times a year. \$8.00 for a subscription. The first issue should be out in January.

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FORUM

There is a smart terminal program for the TS1000, 1500 and ZX81, but it has not been marketed. I contacted the Micro-Systems Software Company, and they told me that they DO have a Terminal II program for the 1000. I understand that there are a lot of people who would like this program. We need to know your interest in the idea of getting this program on the market. There is a company that will market it, but they need a demand for the program in order to release it.

We Sinclair computerists have to stick together and see if we can get them to sell the program so that we can up and down load, just like the 2068 computer can. The 1000 may be small but we were first on the market and I think that its our turn to stand up and let people know who we are.

If you would like to show your support in getting the Terminal II program out, please let us know. Let your user groups in on it, tell everyone you know and print it in your group periodicals.

Please show your support. Send your letters to:

Ed Burton
Timex User Group
1624 Loughborough Dr.
Merced, CA 95340.

As more and more "Spectrum" look-a-likes are appearing, the need to have a standardized bus conversion is necessary. This is so peripherals for one persons machine will work on another, whether they are homemade or bought from England.

A buffered bus board is clearly required, but how should it look? For instance:

1. Should the address lines be bi-directional (for DMA)?
2. How should the y, U and V signals be handled? Should they be ignored or converted to RGB (that is, put RGB where these pins are on the Spectrum bus)?
3. What about ROMCS? How should we decode or otherwise handle this and other signals, which don't mean anything to a 2068? (or do you mean Spectrum?-ed.)

We are looking for comments on from anyone who is making and/or buying devices or contemplating it.

Please send your comments to:

Paul Donnelly
LIST User Group
PO Box 438
Centerport, NY 11721-0438

Gary Smith reports that a lot of Forth 2068 software has been sold. He thanks all of you. The current issue of his Xforth Xchange is almost totally 2068 related improvements and refinements. If you have not received this issue, then make sure you drop him a line and get this important stuff. His address is elsewhere in this issue.

The Aerco Disk User Group is being formed. This national group caters to the interests of those who interface their computer with the Aerco disk interface. Contact:

R. Burke Mawby
ADUG
PO Box 89
Matawan, NJ 07747

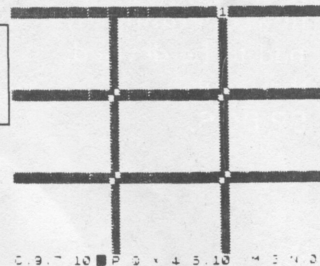
Dear Editor, there is a mysterious character (~) that appears in program listings in several places, for example, the ZX/Profile manual. This character is nonexistent on my TS1500. What does it mean?

Robert Gray
21 Mt. Kemble Ave.
Morristown, NJ 07960

This Mysterious character is a tilda. It is better known as CHR\$126 on a large printer. On a Sinclair computer, CHR\$126 has another very important meaning. When you LIST a program, and come across this character (7E hex), it says "the next five bytes are a floating point number so skip over me and the next five bytes." To the Memotech parallel printer interface, it has another meaning. The first line of a listing done with this interface will show this character instead of the inverse > (cursor). It is practically a trademark for this device. Another thing to remember about this CHR\$ is that you cannot edit it in a REM line (see LEDout, SWN 2/2), or you will lose six bytes of code in the middle of your program. The machine code mnemonic for 7E is LD A, (HL).

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Dear Editor, I have purchased a Byte-Back RS 232 unit for my 1000. This has worked great for telecommunications at a low cost. Although the Modem 2 software works great, it is somewhat inconvenient for upper and lowercase conversions. Do you know anyone who has or knows how to improve this problem? Byte-Back sent me the machine code listing, but I don't know where to start. Does anyone know how to get this RS232 port to run at 1200 baud, and will the Modem 2 software run that fast? Also, could I possibly use the 2050 modem software instead?

Larry Desch
1333 Carroll
Iowa City, Iowa 52240

Sure, you can use the 2050 modem software. Just be sure to pick up a 2050 (Westridge) modem with it (see the first letter). For the upper and lower case problem, look around the listing until you find an IN command (such as, IN A, (C)), and follow the listing back (to find the conversion table) and look for an ADD A,14 or SUB A,14 (also SUB A,7) surrounded by a bunch of CP (compares) instructions. This should place you squarely in the middle of an ASCII conversion table. You can compare your manual to the RS232 character table instructions and change these conversions to print out any characters that you want. As for the 1200 baud rate changes, I'll have to forego that one for the time being as I don't have the interface. Does anyone else know? Let us know.

Dear Editor, I am planning on converting Spectrum software and I was wondering if you could answer a few questions.

1. Which is better, Zeus Assembler or JRC Z80 Assembler?
2. Which is a good machine language book for the 2068?
3. Which book has information on Spectrum system variables and memory map, and is Dr. Ian Logan's, "The Complete Spectrum Rom Disassembly" worth buying?
4. Do you know the difference between the two ROMs? (The 2068 uses 8K more than the Spectrum.)

Chia-Chi Chao
73 Sullivan Dr.
Moraga, CA 94556

Good questions! First, if you are planning on converting Spectrum software, you'll need a good disassembler too. Since many Spectrum programs are quite large, I suggest Hot Z-Aros, because you can load large programs in memory with HZ plugged in the cartridge port. (This is the only program currently available that can accomplish this feat.) I have not used either Zeus or the JRC assemblers at this time, so I can't say which is better. (Anyone out there care to do a comparison? Let us know.) Since the 2068 has a Z80 CPU, the obvious advanced machine language programming manual is Rodney Zak's, which is available everywhere (I'm not fond of it myself). I suggest a good community college course to learn this, because you must do the work. Hands on is the only way to learn this abstract concept. You can pick up applications books for tips, but there really is no good way to learn machine code (only

the hard way). I strongly suggest Dr. Ian Logan's book. The code for most of the routines is identical between the two machines. The location of the code has been changed and some of the routines have been expanded in the 2068 (see Ray's article in this issue). For the changes (if you don't want a Romswitch), I suggest that you subscribe to LIST or otherwise get in touch with Nazir Pashtoon c/o LIST, 10 Idle Day Dr., Centerport, NY 11721. He has cross referenced all of the conversions between the two machines. Lots of Luck!

Dear Editor, I have the Compusa disk drive system that I use with a 1000 and a 1500. With the 1500 computer, RAMTOP is set properly no matter how much extra ram I have plugged in, but with the 1000, RAMTOP is always set at 31379. If I poke ramtop to another value, it doesn't work.

Tony Gomez
2013-3 Los Feliz
Thousand Oaks, CA 91362

The problem of improper RAMTOP is due to the value in the BC register pair on powerup. In the 1000 on startup, BC holds 7FFF. In the 1500, BC holds 0000 (uninitialized). Subsequent decrementing leaves RAMTOP all the way up in a 1500, and has it somewhere less than 16K in a 1000. However, if you can decipher the abstract program at the back of the manual, you can set both ramtop and the directory pointer at will.

In the following listing, RT=Ramtop and PT=Directory pointer. PT can be any value above Ramtop or in the 8-12K block (needs enough room for two screens). This listing sets Ramtop at the level for 16K increments with PT at 2 bytes above it.

```

00REM COMPUSA FDC-100 V.5
10 LET RT=PEEK 16388+256*PEEK
16389
20 PRINT "CURRENT RAMTOP IS ";
RT
30 PRINT "ENTER COMPUTER/RAM C
OMBINATION"
40 PRINT "1- ZX-81/TS-1000 WIT
H 16K"
50 PRINT "2- ZX-81/TS-1000 WIT
H 32K"
60 PRINT "3- ZX-81/TS-1000 WIT
H 64K"
70 INPUT A
80 IF A=1 THEN LET RT=31379
90 IF A=2 THEN LET RT=47763
100 IF A=3 THEN LET RT=63571
105 IF A>3 OR A<1 THEN GOTO 70
106 CLS
110 PRINT "RAMTOP WILL NOW BE S
ET TO ";RT
111 PRINT "FOR COMPUSA DIRECTOR
Y"
112 PRINT "PROGRAM DELETES ITSE
LF"
113 PRINT "BECAUSE OF POKES TO
RT AND PT"
115 PRINT "WHEN K CURSOR RETURN
S"
116 PRINT "RAMTOP = ";RT
117 PAUSE 500
120 LET HI=INT (RT/256)
130 LET LO=RT-HI*256
140 POKE 16388,LO
150 POKE 16389,HI
160 LET PT=RT+2
170 LET HI=INT (PT/256)
180 LET LO=PT-256*HI
190 POKE RT,LO
200 POKE RT+1,HI
210 NEW

```

As a TS2068 computerist with very little programming knowledge, I rely on ready to run, friendly programs. I would like to see an article on how I can make backup copies of programs that appear to be unlistable.

Dennis Silvestri
256 Lloyd St.
New Haven, CN 06513.

There are a few built in commands that you have to help you in your struggle. First, use your MERGE "" command. No program is "safe" from this (see Tasman and Quadrachant elsewhere in this issue). For those unlistable programs, try changing the color of the INK to see if you can then LIST it and see it. Some programs (mostly games) are headerless. There is just nothing to list in this case. I suggest an attenuator and two tape decks. A Winky 2000 (G. Russell Electronics) will allow tape to tape duplication to make backups. A Header reader (we'll have one in the next issue) will read out the parameters of the CODE and allow you to MERGE and LOAD CODE in one line, and then SAVE everything in one command line. Quite often programs will reserve a flag somewhere in the system variables that will tattle on your copy, and cause other problems. There is no end to copy protection schemes.

One day, I was merrily strolling down the street and noticed a small square paper blowing by me in the gentle breeze. Being a responsible, civic minded citizen, I knelt down and retrieved the paper, meaning to throw it in the trash at the next available can. I had my kids with me, who still require being led by the hand, so I stuffed that paper in my pocket and went on about my business.

A couple of days later, while going through my pockets to prepare the wash, I rediscovered that little paper and this time put it in my shirt pocket. I went upstairs to toss it out and low and behold, I noticed some very faded writing on it. I said to myself, "Hmmm, this is thermal paper with some dot matrix type on it!" Upon making that discovery, I set about trying to rejuvenate and decipher the note. I tried for hours to reassemble all those faded characters, but in the end, alas, I could make neither heads nor tails from my discovery and tossed the paper in the can. All I had to show for the hours of trial and error, trials and tribulations, etc., etc., were the following two lines. They don't do me any good, but maybe you can pick up where I left off and find a use for them.

```
MERGE "" : POKE 23624,9: BORDER 1
: INK 1: PAPER 1: CLS : LOAD ""S
GREEN# : PRINT AT 16,0: LOAD ""C
ODE : STOP
```

```
SAVE "UU3D" LINE 9: SAVE "UU3D"S
GREEN# : SAVE "UU3D"CODE 30720,3
4815: STOP
```

The moral of the story is: Role up your sleeves, grit your teeth and DO IT. DON'T rely on anybody, because you can't count on being given exactly what you need. You don't always find the answer you need, but I've found that picking up tips here and there can be useful if you can just apply them to your own situation.

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PRODUCTS ON PARADE

Spectrum Compatibility & the 2068 Romswitch

Paul Donnelly
LIST User Group
10 Idle Day Drive
Centerport, NY 11721

As most 2068 owners know by now, you can gain access to the hundreds of Sinclair Spectrum software titles available in the U.K., by changing your 2068 ROM (Read Only Memory). This can be done in a number of ways, and one quite elegant method is by the use of the Russell Electronics' Romswitch.

Romswitch is a small (2"x2") double sided PC board on which is mounted a Spectrum 16K ROM chip; a glass encapsulated, miniature magnetic reed switch; a pair of pullup resistors and a socket for your Timex Home ROM. The board layout is straight forward, and despite the use of one jumper, the plated through holes indicate a desire for high quality design and construction. The final component of Romswitch is a small "button" magnet mounted on an adhesive backed slide. We'll talk about that later.

Installation of this device requires only a Phillips and a regular screwdriver. It involves opening your 2068 case to install the board in the 16K ROM socket. The procedure is simple and described in detail in the accompanying documentation. Having installed several Spectrum ROM's myself, I think I can say that the documentation is quite complete, and it should allow anyone with a reasonable amount of manual dexterity to perform the installation. After closing the case, you install the button magnet "switch" on the keyboard (next to the 0/DELETE key). You must move the switch around to establish the proper placement (before removing the adhesive backing), but since you can hear the reed switch (experiment with this outside the machine before you start) contacts closing, this task should pose no serious problem.

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 **BIOCAL**
SOFTWARE, INC.
167-C Wilson Street
Petaluma, CA. 94952

Once the "switch" is installed, you can go back and forth between Spectrum and TS2068 at will! (POWER OFF ONLY!!) While I strongly recommend that you do not flip the switch with the power on, I tried it anyway. No harm was done (guaranteed crash and loss of program), but you might initiate bus contention during contact, and that could lead to losing a chip. Anyway, this is the singularly outstanding feature of Romswitch over the other conversion methods.

Two other methods of Spectrum conversion are Doug Dewey's (TSUG, 206 James St., Carrboro, NC 27510) Chameleon (EMU-1), and of course, simple ROM replacement. With the Chameleon, you must insert and remove the cartridge board each time, although it requires no tools to install and leaves your warrantee valid. Direct ROM replacement needs tools, like Romswitch, and requires opening the case for each change, but the cost is less than \$20.00. Both Romswitch and Chameleon will each draw more power as both chips together will draw more juice. Meanwhile, Romswitch will give you a way to switch back and forth, without opening and closing anything, without drilling a hole in your case for a switch and will leave your cartridge and edge connectors open for other applications.

The one weakness of the Romswitch is that same magnetic switch. Mine started to move around after a while, so be sure to clean the keyboard area well before application of the switch. Unfortunately, the Spectrum Rom is soldered in with pin 27 cut off. This makes the board or the chip difficult to reuse for other purposes.

Overall, I give the Romswitch a 9 out of 10. Quality and convenience are high, but so is the price. I would like to see a kit or bare board version made available for development projects. Romswitch is a viable contender in the field of "Spectrumizing" your 2068, and it may be just what you're looking for.

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Celestial Computing

Duncan R. Teague
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For centuries, astronomers have been using electrical and mechanical devices, such as orreries and planetariums, to explain, predict and reproduce the motions of the heavens. Today the astronomer has a powerful new tool at his or her disposal -- the personal computer.

The backyard astronomer should not expect a computer to work miracles. The computer will not, without considerable expertise and money, point your telescope toward a precise position in the sky. It will not observe for you and alert you to the discovery of a new comet, supernova or U.F.O. It will not grind and polish the mirror for your new, larger instrument.

The computer will, however, calculate the positions of celestial objects; compute the rise, transit and set times of the Sun, Moon and planets; assist in the telescope design; determine the correct exposure times in astrophotography; draw Keplerian orbits; simulate relativistic journeys to distant stars and anything else that the programmer's imagination and creativity will allow. The computer will help you enjoy your "other" interest -- astronomy.

Computerists and astronomers have much in common. Both have a fastidious interest in detail, an appreciation of precision and a love of things beyond the ordinary. It is natural that this publication carry a regular column devoted to computer astronomy. With this issue, such a column begins.

Celestial Basic: Skyplot

Author:
Eric Burgess
S and T Software Service
13361 Frati Lane
Sebastopol, CA 95472

Publisher:
Sybex Inc.
2344 Sixth St.
Berkeley, CA 94710

Eric Burgess' "Celestial Basic," is a collection of astronomy programs converted for Sinclair Basic and published in "More Uses for your TS1000: Astronomy on your Computer."

SKYLOT displays the positions of the Sun, Moon and planets for any date, time or location. Each object is shown with reference to the observer's horizon in a display similar to the view from a large picture window. First, you enter the local latitude and longitude and then the time for the display as year, month, date, time zone (subtract one for daylight savings time) and local (24 hr.) time. Finally a choice of horizons is offered (N, S, E, W).

The screen builds a nice panoramic view of a city near the bottom of the screen with cardinal and inter cardinal directions below it. There is an altitude scale marked every five degrees on the right side, and a summary of the time and location

is at the top. On center stage is the display of the celestial objects visible for the given time and location.

Venus and Pluto are identified by their initial letters. The sun is an "O," and Mercury is a "+" sign in order to distinguish it from Mars. The moon is shown as a "0" when full, as a ")" before full and as a "(" after the full phase.

Skyplot easily uploaded to my 2068, and a number of modifications became possible. The 2068 user defined graphics capabilities allow replacement of the initial letters for each of the planets with its astrological symbol, and I changed the block character city into tiny trees, houses, etc.

Interesting to note is that all 10 solar system objects (eight planets, sun and moon) are grouped in the same quadrant of the sky on October 26, 1984. March 10, 1882 is another interesting date. There's a small prize for the first person to identify the significance of that date.

The program may be typed in from the listing in the Sybex book, or a tape is available for \$12.00 from the author.

2068 & Spectrum REVIEWS

S.J. Wyatt
PO Box 6239
Washington, D.C. 20015

Halls of the Things/Crystal Computing
Manic Miner/Bug Byte
Jet Set Willy/Bug Byte
Lunar Jetman/Ultimate Play The Game

These four programs for the ZX Spectrum have several things in common. First of all, they are all of truly "ARCADE" quality with excellent graphics and sound. Secondly, they have all occupied the #1 spot on the European charts in 1983 or 1984. Lastly, they will all run on the 2068 with few or no changes.

Halls of the Things

In "Halls of the Things" you are in a seven story house with treasure and rings of power to collect. You need to collect those rings in order to gain access to the basement where the main treasure lies, but beware! There are monsters. They have fireballs, lightning and arrows just as you do; and their aim is deadly. By using EDIT (caps shift/1), you can check your status on wounds, elixir left, arrows left and monsters killed. You can increase your elixir by picking up the bottles which are scattered throughout the house and then using the H key to heal some of your wounds. Don't let your elixir level get down to zero though because it not only allows you to repair yourself, it is also the magical basis for your fireballs and lightning.

"Halls" is essentially a maze/adventure game on 7 levels that stretches the Spectrum (and now the 2068) to its limits. It makes no use of sound, but you wouldn't have the time to listen to it anyway. The graphics are fast and very smooth. The only

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drawback with this game is the number of keys one must learn in order to control the action. The arrow keys are used to assign the direction for the arrows (A). Then you have Z/X-left and right, N,M-up and down (K)eep, (D)rop, (O)pen, (C)lose, (L)ightning, (F)ireball,(H)eal and W/Space to alter the contrast if needed. The monsters become more vicious and numerous the closer to the basement, so start on the top and work your way down. (I've had this one for over a year. I still play it and haven't gotten into the basement.)

All in all, this is the best maze game I've seen for a home micro. It is entirely in machine code and requires no changes to run on the Timex 2068.

Manic Miner

"Manic Miner" is one of those classic games that spawn an industry of clones. Upon loading (see below), the opening screen shows Miner Willys' house on the lake with the sun setting (rising) in the background. Below, there appears a keyboard with the keys being appropriately pressed for the opening tune, and below that are the instructions for the game. I have found that the cursor keys work and prefer them to the ones given in the introduction. Don't touch the keyboard yet. In a bit the game will give you a tour through all 20 caverns culminating in the final barrier which is just below Willys' house. The graphics are incredible and give you an idea of what lies ahead. Poison bushes, spiders, crazy mining robots and other creatures of some long forgotten civilization are out to stop you from gathering all the flashing items and progressing to the next cavern to solve new puzzles. When you jump onto a conveyor belt, there is no turning back. Timing must be just right and the disappearing floors make matters even more complicated. With 5 for left, 8 for right and 7 for jump, this can be fairly quickly adapted to so that you can concentrate on getting past the first cavern and on into the next.

Manic Miner is a stunning example of the sort of arcade game that can be used on the TS 2068, and you'll find yourself humming or whistling "Hall of the Mountain King" well into the wee hours.

Loading

Step 1: TYPE MERGE ". When the report OK 0/0 appears, stop the tape.

Step 2: Hit ENTER to get the Basic listing. Look for the CLEAR XXXXX statment. This is what must be altered. The Spectrum BASIC program area starts at a lower address than does the 2068, so Spectrum programs often CLEAR down to around 24000. We need to change the 4 to a 7 or 8. EDIT the CLEAR statement to make that change. (If the line won't EDIT, then look at the line number. If it is zero, then type POKE 26711,1. This will alter the line number and allow you to make the changes.) When you're done hit RUN or CONTINUE and start the tape again.

Step 3: Sit back, relax and enjoy.

Jet Set Willy

"Jet Set Willy" comes to us a year later and is the natural sequel to Manic Miner. After finally gathering all of the treasure of the ancients, Miner Willy has moved to a huge mansion complete with swimming pool, yacht and a maid, Maria. Willys new quest is to pick up all the glasses and bottles lying around from the party the night before or the maid won't let him get to bed (although zapping him if he tries might seem a little extreme). There are between 40 and 60 locations, and unlike Manic Miner, you can go exploring without picking up all the articles before leaving a room. The graphics and movement are as good as in Manic Miner, and this time Willy is accompanied through the house and yard by the tune, "If I were a Rich Man." The cursor keys provide left and right movement with zero for the jump key. Mathew Smith, the author of MM and JSW, has spent some time and energy creating the characters for this program, and it shows. From rotating razor blades, dancing swiss army knives and pirouetting rabbits to the swinging ropes and 3-D battlements, the attention to detail is nothing short of astonishing. As a set, JSW and MM should be on the top of anyones wish list. Loading is the same as for Manic Miner.

Lunar Jetman

The final game, "Lunar Jetman," is also the most recently released. According to the cassette insert, the Jetman's rocket is disintegrating, but he manages to crashland on an uncharted world of aliens who are intent upon Earths distruction. Your job is to help him knock out the alien missile bases scattered around the planet while dodging and shooting the aliens. At your disposal are the lunar rover which you enter and leave using caps shift, the bomb (to drop on the missile base) or the cannon (shooting aliens and building score). The rover can't jump craters, so you have to use the bridge sections in the vehicle to fill them in. You can pick up and drop objects with the Z key. When the timer gets to zero the enemy base will launch its missile so you have to leave the rover, fly forward to intercept using JETMANS rocketpack, get behind the missile and apply JETMANS "laser phaser" to the tail of the missile. The screen will inform you of the launch of the missile and the number of hits that will be required to knock it down. You'll find a pair of teleportation booths that allow you to jump between them. Later, certain of the aliens will pick up the teleporters and move them around, apparently at random. Options for control include the Kempston interface (works on the 2068 if you remove the Kempston case), the keyboard and once again, the cursor keys which I now find myself accustomed to. You will find the graphics and movement just as good and the game just as addictive as the others in this review.

These programs and others are available in the U.S. through:

Phoenix Enterprises
1780 N. Dupont Hwy. #17
Dover, Delaware 19901
302-734-0179

2068 Character Builder

John (Basil) Wentworth
1413 Elliston Drive
Bloomington, IN 47401

The TS2068 offers a very powerful feature in its capacity to build up user-defined characters. However, the procedure for building up those characters is a bit of a pain in the neck. This program will simplify that procedure for you.

First, a quick review of those user-defined characters. You probably already know that all of the characters printed by the TS2068 (and by the good old ZX81 and ZX80) are constructed on an 8 x 8 matrix. Each location of the matrix (these locations are called "pixels") is assigned either a dark spot (ink colored, in the case of the 2068) or a space (paper colored). When they are displayed on the screen, these pixels are integrated by the eye into continuous lines. If you're interested, you should be able to resolve them into their pixels by using a magnifying glass.

The TS2068 allows you to assign ink or paper colors to the pixels of your choosing, so you can build up (and PRINT or LPRINT) any character that you can define by the 64 pixels available.

The character you have defined is then assigned to a key - any key you want, between A and U, inclusive. Once you have made this assignment, the GRAPHICS output of the key you have chosen will give you the character you have built up. Apparently forever, as time is measured in computer terms. Cutting off the power will lose the character, of course, and it can be overwritten with a new character, but it will survive such ordinarily fatal procedures as NEW and CLEAR. And SAVE and LOAD.

How It Works

The program given is a rudimentary turtle. The display defines the matrix within which you will work, giving a co-ordinate grid for the pixel positions. The turtle can be moved by the customary shifted 5-8 keys, and a cursor shows you where he is standing at any moment. If you press "1" the turtle lays down an ink-colored tile where he is standing; if you press "0", he picks up any tile that may be lying there. When he has finished, you are left with a mosaic that represents the character you have built.

Sometimes it takes a little imagination to visualize how the character will look when it is reduced to operating size, but you'll just have to do the best you can. You can always change the character if it doesn't come up to your expectations.

If you are satisfied with the character, press "STOP", and the computer will ask you to which key you want to assign it. INPUT a letter between A and U, inclusive, and PRESTO! you've done the job. Well, not exactly Presto - sort of more of a Larghetto, if you're familiar with the terminology of music. The process actually takes a few patience-trying seconds. For the sake of those who are as fidgety as I am, I included a little

reminder from the computer that it hasn't gone to sleep, plus an audible TA-DA! when the job is done.

```
10>LET A$=""
15 LET A$=A$+A$
20 LET SC=0
30 FOR F=1 TO 8
40 PRINT AT F-1,8;F;AT 8,F-1;F
50 NEXT F
55 PRINT AT 0,0;"↑"
60 IF INKEY$="" THEN GO TO 60
70 LET P=PEEK 23560
80 LET SC=SC+(P=9)+8*(P=10)-(P
=8)-8*(P=11)
90 IF SC<0 THEN LET SC=0
100 IF SC>63 THEN LET SC=63
110 LET V=INT (SC/8)
120 LET H=SC-8*V
130 LET Z$=""
140 PAUSE 5: PRINT AT V,H;Z$
150 PAUSE 5: PRINT AT V,H;A$(SC
+1)
160 IF INKEY$="1" THEN LET A$(S
C+1)="█"
170 IF INKEY$="0" THEN LET A$(S
C+1)=" "
180 IF INKEY$="" THEN GO TO 140
190 IF P<>226 THEN GO TO 60
200 REM GO TO 60
210 PRINT AT 12,1;"WHAT KEY DO
YOU WANT TO CARRY THIS CHR$ (A
-U)?"
220 INPUT B$
250 PRINT "I'm thinking, I'
m thinking!"
1000 FOR G=0 TO 7
1010 LET B=0
1020 FOR H=1 TO 8
1030 LET Z$=A$(8*G+9-H)
1040 LET N=(Z$="█")
1050 LET B=B+N*2*(H-1)
1060 NEXT H
1070 POKE USR B$+G,B
1080 NEXT G
2000 BEEP .25,12
2010 BEEP 1,12
4999 STOP
5000 SAVE "FIG" LINE 1
```

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THE CASSETTE CONNECTION

by Fred Nachbaur

In Volume 1, I ran a series on improving cassette reliability on the ZX81. Well, now that the TS2068 has arrived, that's all obsolete, right? Wrong! If anything, in my experience the 2068 needs even more "outside help" in getting reliable loads.

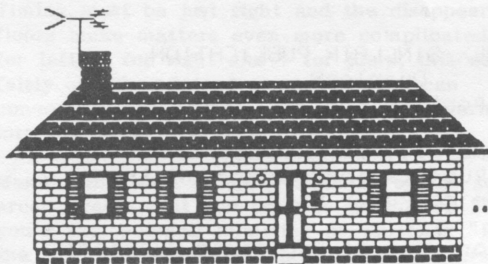
First, let's take a look at the load signal itself. As you may have noticed, the actual program is preceded by a header which consists of about five seconds (4032 cycles) of an 806.5 Hz. tone. This "sync pattern" is presumably used to set timing and compensate for variations in recorder speed. This is followed by:

1. The type of save (program, numeric array, string array or code)
2. A name up to 10 characters
3. The length of the file
4. The starting line number, variable array or address
5. Then (in the case of program saves) the offset to the variables (VARS-PROG).

After the header is a brief silence (though I use that term loosely), followed by another 5 second sync pattern and the actual program or data. (This info is from the tech manual.)

The data is represented quite differently from the ZX81/TS1000. Instead of having pulses of fixed width, with five such pulses representing a "0" and nine pulses being a "1", the TS2068 uses the more conventional approach of sending a short pulse (period=.48 ms) for zeros, and a longer pulse (period=.96 ms) for ones. This is, by the way, the same kind of system used by SDS, Z-XLR8 and other fast-load programs for the ZX81. Although it is about four times as fast as the standard ZX81 load routines, it is still considerably slower than the "fast-load" routines; the average rate of data transfer is about 1400 baud (bits per second) whereas SDS, for instance, runs at about 3500 baud and Z-XLR8 is variable up to about the same speed.

According to the tech manual, the SAVE signal is processed with a low-pass filter whose corner frequency is 2.5 KHz., which is very close to the output frequency when sending all zeroes. As a result, the signal is considerably "rounded" before it gets to the recorder. This may help in preventing overshoots and harmonic effects ("beating" with the bias oscillator in the recorder), but it tends to make the signal mushier and less sharply defined in pulse-width. As a side note, the manual also claims that the SAVE signal is between 0.15 and 0.67 V p-p; if this were so, your recorder would be blasted so badly you'd only get garbage. Perhaps this refers to the signal at the edge connector, or perhaps they meant 0.15 - 0.67 MILLivolts (.00015-.00067 V).



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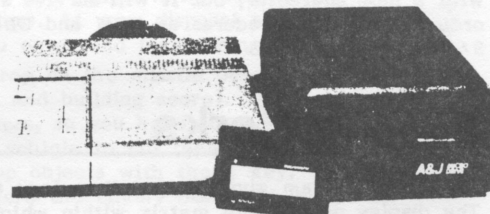
by Gary E. Ward

The two pictures on the left were made using MULTI-DRAW 2068. This program allows you to draw on the screen with only the use of the joystick! Turn on/off any pixel(s) at will (Instantly MAGNIFY the area in that your working on, for ease of use), then output your masterpiece to either a TS2040 printer, or a full size dot matrix type printer using either the AERCO or TASMAR interface. Also, with a full size printer attached, you have a choice of SMALL PRINT, LARGE PRINT, and GRAY PRINT (large size), and all can be accomplished by simply moving the cursor with the stick to your desired choice. Some of the options available with the stick are:

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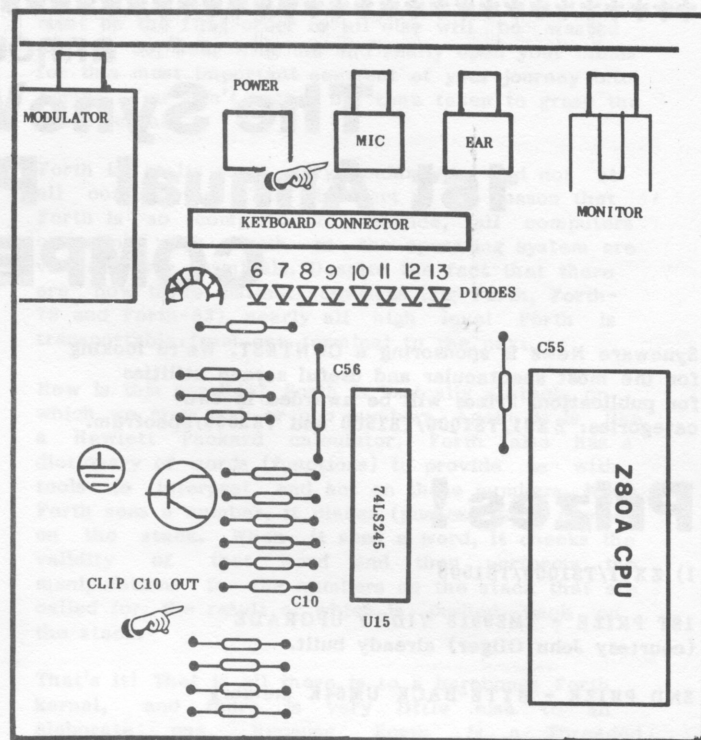
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The LOAD section is low-pass filtered at a much higher breakpoint (23 kHz.), so the effect this filter has on the load signal is negligible; it would not even significantly reduce any horizontal blanking pulses that might find their way to the tape. The sensitivity of the LOAD section is even less than the ZX81/TS1000, so a comparator or op-amp pre-conditioner is definitely recommended for this machine. Also, because of the extreme rounding of the save signal, volume setting is more critical; the range over which the pulse width is within acceptable limits is quite narrow, even with a pre-conditioner.

Now the Good News!

Now, the good news. There is an almost absurdly simple way of fixing this.

1. Remove the 7 screws that hold the two case halves together, gently separate them and unplug the keyboard.
2. Remove the three screws that hold the board to the lower case-half, one near the speaker, one near the "Timex 2000" logo and one next to the cartridge connector.
3. Lift the board out and turn it over.
4. Shunted directly across the MIC jack, on the wiring side of the board, you'll find a small blue (on my machine) 120 pF. capacitor. Remove it, and throw it into your junk box. (Who knows, it might be useful for something.) This alone might do it.
5. There is another identical cap in parallel with this one, located about 2" to the left of the CPU and just to the left of an LS245 (U15). It is marked C10, though the legend may be hard to see; it's the smaller one, at the bottom of a row of components. Clip this one also.
6. Re-assemble the machine, and you're done.



Before I performed these "cap-ectomies" on my machine, I couldn't load tapes I'd saved on the TS2020 recorder, though other recorders worked sometimes. Now it works just fine, and is less sensitive to variations in playback level. What we've done is remove that low-pass filter and squared the save signal back up. It is unclear why C10 was included and downright obscure why another one was tacked on afterwards. Perhaps they were afraid of too much RFI and possibly flunking FCC testing.

If this results in too much noise on your machine, or if it didn't improve matters any, put one of the caps back in and try it again. It could be that you're getting harmonic "beating" with the recorder's bias oscillator. If you still have no joy, your problem is most likely with the load, rather than the save. Try a Winky board, VOTEM, the circuit in Volume 1 or other load signal pre-conditioner.

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Deadline for entry is May 15, 1985, and the winners will be announced in the July/August 1985 issue of Syncware News. All entries must include a CASSETTE TAPE of the program(s), and should be mailed to:

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- 5) DOCUMENTATION
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All entries become the non-exclusive property of Syncware News. Syncware News reserves the right to publish winning entries in upcoming issues. EVERYONE is eligible. East coast entries will be judged on the West coast and all western entries will be judged in the East. We are presently soliciting user groups to judge entries.

All entries must work with NO ADDITIONAL HARDWARE (except TS2040/ZX printer, and 16K RAM pack and/or JLO TMS9918 video upgrade for ZX81/TS1000) and should require no additional commercial or proprietary software. This will make judging entries less of a monumental nightmare, although support of other hardware or software options will be taken into consideration. The finalists will be judged by a panel consisting of the staff of Syncware News. All decisions of the judging panel are final.

Remember, you can't win if you don't enter. So get started on your project NOW, and

c'mon you wizards, start hackin'

TYD/BYTS

Paul Bingham
Pleasantrees Programming
PO Box 7345
Mesa, AZ 85206

UFO 2068

This first little "ditty," creates a UFO that you can add to your games and play around with. A few BASIC tricks are incorporated in this listing. Lines 120 to 150 control the direction, using the 1, 2, 3, Q, E, A, S and D keys. Line 1 changes the BORDER to magenta and the colors of the edit lines with the use of RUN 10. Line 10 takes the place of 24 lines of "POKE USR "a"+1, BIN 00100000," etc. By using the loop to poke the bit patterns, it is much faster.

```

1 BORDER 3: RUN 10: REM UFO
4 PRINT AT r,c;CHR$ 144: RETU
RN
5 PRINT AT r,c;" ": RETURN
10 FOR i=65368 TO 65391: READ
d: POKE i,d: NEXT i: DATA 0,66,2
4,36,36,24,66,0,32,16,45,34,66,1
80,8,4,4,8,180,68,34,45,16,32
100 LET r=9: LET c=15: GO SUB 4
110 LET z=CODE INKEY$: GO SUB 4
120 IF r>0 AND (z=49 OR z=50 OR
z=51) THEN GO SUB 5: LET r=r-1
130 IF r<21 AND (z=97 OR z=115
OR z=100) THEN GO SUB 5: LET r=r
+1
140 IF c<31 AND (z=51 OR z=101
OR z=100) THEN GO SUB 5: LET c=c
+1
150 IF c>0 AND (z=49 OR z=113 O
R z=97) THEN GO SUB 5: LET c=c-1
160 PRINT AT r,c;CHR$ 145;AT r,
c;CHR$ 146: GO TO 110

```


BITS

Speaking of bit patterns, here's another little ditty that will print out all of the possible bit patterns (0 to 255). This listing is taken from Graphics A to Z, and has been converted for the 2068. It takes about 30 seconds to generate all the patterns. If you would like a listing, then change all of the PRINTs (80, 100, 110, 120 and 130) to LPRINT and hook up your printer. This list will be very useful if you do any user defined graphics.

```
1 REM                               List of 256
                                bit patterns
10 LET a=0: LET b=65536: LET c
=b+167: LET d=164: LET e=1
20 GO SUB 300
30 DIM l(2049)
40 GO SUB 170
50 LET c=b+87: LET d=154
60 GO SUB 300: GO SUB 170
70 LET h=0: CLS
80 FOR f=1 TO e STEP 8: PRINT
h;TAB 6;
90 FOR g=f TO f+7
100 IF l(g)=0 THEN PRINT " ";
110 IF l(g)=1 THEN PRINT "■";
120 NEXT g: PRINT " "
130 FOR t=f TO f+7: PRINT l(t);
: NEXT t: LET h=h+1: PRINT "": P
RINT ""
140 IF h=256 THEN STOP
150 NEXT f
170 FOR f=144 TO d: PRINT AT 0,
0;CHR$ f
180 FOR y=175 TO 168 STEP -1
190 FOR x=0 TO 7: LET l(e)=POIN
T(x,y): LET e=e+1: NEXT x
200 NEXT y: NEXT f: RETURN
300 FOR t=b TO c: POKE t,a: LET
a=a+1: NEXT t: RETURN
```

TEST TIME

For a little project, incorporate Tom Wood's 2068 Decimal to Hex conversion (see last issue) before LPRINTing and add a column of Hex numbers next to the decimal numbers. Use this in conjunction with Basil's character builder too. This task will really get your feet wet with your own graphics.

Forth is a State of Mind

Gary Smith
Hawg Wild Software
PO Drawer 7680
Little Rock, AR 72217

I would like to thank those of you who took the time to write and encourage the continuation of this column on the Forth computing environment. I cannot overstress how important reader involvement is to me as a writer and to the continuation of this column. Thanks. Please keep the cards and letters coming and let me know what your interests or needs are.

One of the problems encountered when introducing Forth to others, is explaining how a language that is so strong and rich can and must be extremely simple and elegant. These terms are not as contradictory as they seem on the surface.

I must postpone any meat and potatoes programming for one more issue. The idea and concept of Forth

must be the first order or all else will be wasted effort. So, bear with me and really open your minds for this most important segment of your journey into Forth. You won't regret the time taken to grasp the fundamentals.

Forth is, at its roots, very fundamental and not at all complicated. This is part of the reason that Forth is so compact. In essence, all computers operating with Forth as the operating system are virtual Forth terminals. Despite the fact that there are now three distinct standards (fig-Forth, Forth-79 and Forth-83), nearly all high level Forth is transportable from one terminal to the next.

How is this possible? Forth is basically a stack, on which we may push or pop numbers. Again, it is like a Hewlett Packard calculator. Forth also has a dictionary of words (functions) to provide us with tools to interpret and act on those numbers. When Forth sees a number, it places (pushes) that number on the stack. When it sees a word, it checks the validity of that word and then performs the manipulations to the numbers on the stack that are called for, the result of which is pushed back on the stack.

That's it! That is all there is to a barebones Forth kernal, and there is very little else to an elaborate one. Because Forth is a Threaded Interpretive Language* (TIL), it is very easy to add words to your dictionary in order to do more with your data when necessary. This ability to expand the Forth language to fit an application instead of bending the application to fit some "cast in stone" language, is called "extensibility." This is what gives Forth its great flexibility, and we will soon be exploring this virtue in detail.

For the moment, let's look at some stack manipulation words that are standard to all kernals and used time and time again.

DUP(N->N N)

This word will duplicate the top value of the stack.

SWAP(N1, N2->N2, N1)

This exchanges the top and second value of the stack.

DROP(N->)

Discard the top value of the stack.

OVER(N1, N2->N1, N2, N1)

This word will copy the second value to the top of the stack.

ROT(N1, N2, N3->N2, N3, N1)

Moves the third value on the stack to the first one.

Can you understand the "stack notation" (in parentheses)? Stack notation is the short hand prose of Forth. Remember the following:

1. The stack is a LIFO stack. This means that the last number pushed on will be the first number popped off, unless of course, we alter the order of the stack. Even then, the altered stack is a LIFO stack.

2. In stack notation, the right most number is the top of the stack, ALWAYS!

Now, can you understand the stack notation for these five very essential words?

Given the following stack:

5 4 2 3 1 1

Use the previous words to convert it as follows:

5 4 3 2 1

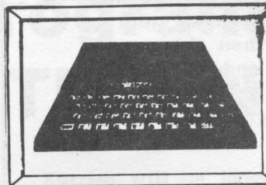
The solution will be in the next installment.

There is never one, and only one, correct solution in Forth. There are solutions that are the result of better programming practices, and there are solutions that better use the facilities available in your Forth kernel. Those solutions are without a doubt more elegant, but not necessarily more correct.



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BANK SWITCHING THE 2068

TS2192 COMPUTER

by Ray Kingsley

The 2068 was introduced to us as a memory manager, capable of handling up to 256 banks of 64K memories, a veritable elephant among small plastic boxes. Close inspection revealed that an item called a BEU (meaning either Bus Expansion Unit or "hello" in Elephant) was necessary to access most of the extra memory banks, but not all. Three banks are native to the machine, almost, so you can have 192K with but a fraction of the trouble that it took to implement the full 64K on a ZX81.

There is the 64K that imitates the Spectrum. That comprises the 16K BASIC ROM and the 48K of RAM and is called the Home bank. The Home bank is in fact Bank FF (255). There is an entire 64K bank called the Dock (Bank 00), which was intended for cartridges, and which can be made active in 8K "chunks" anywhere in the 64K addressing space of the Z80. Finally, there is a slightly crippled bank known as the EXROM bank (Bank FE or 254), which was designed with the same lack of foresight that brought us the 16K-forever TS1000.

There is a hardware problem with the EXROM bank. The MREQ line that enables the EXROM 8K chip is active whether or not the address is to the chip or a multiple of the chip address. Three address lines (A13, A14, and A15) are not interpreted by the circuitry on the board, but if you add the circuitry to interpret them, then you gain access to the other 56K. That gives you the ability to communicate with three banks of 64K.

Both of the external banks are available either on the dock connectors under the door of the 2068 or on the bus under the slot on the back. The chip select line is EXROM NOT for the EXROM bank and ROS_CS NOT for the Dock bank. If you switch these lines on a cartridge reader board, like the Olgier cartridge board, then you can read from the EXROM bank rather than the DOCK bank.

The 2068's memory management allows you to activate or enable each 8K chunk of the Z80's 64K of addresses in any bank that you have attached. However, the Dock and EXROM banks have an unfortunate link: they share the port byte (F4) that describes which chunks are enabled (the "horizontal select" byte). If bit 7 from port FF is high, then the byte from port F4 describes the EXROM bank; if that bit 7 is low, then port F4 describes the Dock. What this means is that the Dock and EXROM are mutually exclusive: you can have a mixture of chunks from Home and Dock, as when you're running a cartridge, or a mixture from Home and EXROM, as when you run a cassette operation, but you cannot simultaneously mix Dock and EXROM chunks.

With all of this potential in the machine, a hopeful owner might dream of a disk system with CP/M in one bank, a Sinclair-like system in another bank, and a full bank of cartridge software, or perhaps CP/M 3.0 or even MP/M running the whole show. Only Aerco promises to use the Dock bank for its CP/M adapter, and I hope that promise gets filled in our lifetime.

Memory Management Code

My first experiences with the added Timex features were to discover the many ways in which the so-called function dispatcher could fail and crash the machine. Like many, I said "Why couldn't they just give us a Spectrum in a chiclet box, and maybe a free watchband?" But I got to know the machine by moving HOT Z over from the ZX81, just in case I was missing something. HOT Z took up residence like a large family of relatives, squandering space, scattering new functions all over memory, and generally creating slum conditions (cheerful, but crowded) in my RAM. So I decided to move the whole show to EPROM, where HOT Z could occupy another bank of memory and keep its cotton-picking bytes off my RAM. To do that, I had to get to know the Timex memory management code in the EXROM.

The EXROM bank contains an 8K ROM with the overspill (Save-Load-Verify-Merge) from Mother Time's messing

about with the Cambridge ROM, as well as some extra initialization for the multibank memory management, the more renowned display-mode switches, and finally the source for the RAM-resident code, which normally resides at 6200-6840H.

That RAM-resident code block is generally called the "function dispatcher" simply because that service is the first one of the set. The function dispatcher is an egocentric concept in that it was written in anticipation that programmers would want to cling to the system software that is provided for BASIC. This seems unlikely, in view of the untapped display possibilities of the 2068.

The Timex memory-management code is generally the code that follows the function dispatcher. The technical manual was a revelation, an admission that there were bugs in that code and some suggestions for repairing them. Most of the suggestions worked, at least well enough to get me interested.

Unfortunately, there are mistakes of inattention that come to light even after the published patches. A good single-stepper can sort out the errors. I plodded through, patched up the rough spots, hiccups really, brought on perhaps by the rapid approach of corporate pink slips. When I was finished, the whole plan seemed to work, in so far as I could judge without a pet BEU to trumpet its call.

The rest of this article is a discussion of what I found in the RAM-resident EXROM code and what I've learned about how to use the services there. Much of this is for hardened programmers, but you just might need it some day.

The Function Dispatcher

I was initially puzzled as to what possible use the function dispatcher could be when you can simply make a direct call to the address involved. (The addresses for the function dispatcher are given in a pair of tables at the top of the 8K EXROM.) The RAM-res routines only become useful in a banked environment, where they handle bank switching for you.

If you're writing your code to run in the Home bank, then the function dispatcher is the long way around to do a ROM call. If you want your code to run in a cartridge or in any bank, then you might want to make use of the function dispatcher, though it's really only necessary if your code is in one of the chunks (0 or 1) shadowed by the ROM. Do not suffer the illusion that the function dispatcher makes the ROM calls any easier to use. Those of you who saw my last article here will recall that many ROM routines are best entered at the second or third instruction, and the dispatcher doesn't give you this option.

The function dispatcher itself requires a "service code" (16 bits) on the stack. The service codes are listed in detail in the technical manual; the addresses they correspond to are easily read from the jump table at the top of the EXROM (1EDC and above). Three of these addresses (for XFER, CALL_BANK, and GOTO_BANK) are off by a byte in the original EXROM, and none of those for the RAM-resident routines will work if the second display file is active. Finally, because of sloppy register handling, there is no direct access to the cassette functions.

The function dispatcher is a high-level routine that enables you to exchange a block of parameters with a group of routines that can neither receive nor return those parameters. (They are fixed by the addresses burned into the EXROM.) Thus if you care to take a trip on this Rube-Goldberg device, you must push in succession the service code (high bit low for a CALL) and then four bytes (two pushes) of zeroes to indicate no parameters expected in from the stack and none sent out.

Unless you are writing for chunks 0 or 1, there is an easier way to make ROM calls, which is to enable the Home bank, do the call, and then reenable whatever bank you have called from. For example:

```
LD BC,FFFC
CALL ENAB
CALL XXXX
LD BC,YYYY
CALL ENAB
```

where XXXX is the ROM address, YY is the bank number and ZZ is the horizontal select. You can push and pop around the ENAB call if you need BC. If you want full service, then learn how to use the CALL_BANK routine described below.

Moving Code Between Banks

Another high-level service is the XFER bytes routine at FEE2 or 6722. It moves code in blocks via the stack from one bank to another. This routine exercises the stack almost to its limit of 512 bytes. A consequence of this stack passing is that you cannot use XFER to move anything in or out of chunks that are shadowed by the stack.

My attempts to use XFER uncovered more bugs than I care to list, but once fixed it works very well. To use XFER, you must push in order:

16 bits that comprise the bank number of the source (high byte) and destination (low)

the start address of the source to be copied

the destination address

the length (16 bits)

and finally 16 bits of which the high byte is unused and the low one holds 0 to indicate an LDIR or FF for a LDDR.

Don't pop this stuff off the stack afterwards; that's done for you.

When it's up and running, XFER will move any block of memory from within one 8K chunk to the same or any other bank-chunk where there is RAM. You can use it to copy code from a cartridge into RAM, where you can modify the code and reburn it to EPROM. If you learn how to attach RAM to the Dock or EXROM banks, then XFER becomes indispensable for copying code in and out of the Home bank. (SAVE and LOAD work only on the contents of the Home bank, which becomes the portal to the rest of memory.)

Put_Word and Get_Word are simpler move routines that don't stress the stack. Put an address in HL and a

Bank number in B; then `Get_Word` will bring you back the contents of that address and the next in HL. (Like `LD HL,(NNNN)`, but interbank.) `Put_Word` will put the word in DE at address HL in bank B. (Like `LD (HL),E`; `INC HL`; `LD (HL),D`.)

Bank Enable Routines

The lowest-level RAM-resident routines are `Write_Bank_Status_Register` and `Read_Bank_Status_Register`. These routines do the dirty work of feeding the elephant, enabling memory banks and chunks via the BEU. If you are a hardware sleuth, you might be able to reinvent the BEU from these two routines and the initialization that goes on in the EXROM after 099AH.

The rest of us will probably want to use `ENAB`, which enables chunks of the bank whose number is in B. The enabled chunks are the low bits of C, which holds the "horizontal select" byte. (7F enables only chunk 7, FE enables chunk 0, CF enables chunks 4 and 5, and so on, binarywise.) The protocol is `LD BC, Bank-Chunk` and `CALL ENAB`. Thus `LD BC,008F` followed by `CALL ENAB` would enable chunks 4, 5, and 6, because `8F = 10001111` and the zeroes are bits 4, 5, and 6, counting from bit zero on the right. Since B holds the number of the Dock bank (00), the enablement takes place for that bank. All registers are preserved if, contrary to the tech manual, you correct this routine by replacing the push and pop of BC rather than of AF with the recommended DI-EI combination.

Home bank is enabled by default. Chunks not specified will come up as Home bank.

The `ENABLE` routine was written to go along with the lack of decoding for the EXROM and makes it impossible to enable the higher chunks of the EXROM bank. I remedied this by making the EXROM enabling code loop back through the code for the Dock enable, so that the revised routine treats both banks equally. If you decode the address lines for the EXROM then you should also replace the code in the EXROM to be able to use the extra addressing space.

You can compensate for the inability of the function dispatcher to reach routines in the EXROM by enabling the EXROM (`LD BC,FEFE` and `CALL ENAB`) and then calling any routine you know how to use down there. (Remember to re-enable the chunks you want active after such a call.) There is also a routine at 6815 or FFD5 (`GOEX`) that will switch on the EXROM and jump to the address supplied in HL; if you put a return address in Home RAM on the stack and use that `GOEX` routine to get to a callable routine in EXROM, then the first `RET` will get you back, but don't forget to switch out the EXROM afterward.

Finally, there is one way you can avoid the Enable routine and its bugs altogether for the three banks discussed here. The following routine

```
IN A,(FF)
RES 7,A
OUT (FF),A
XOR A
OUT (F4),A
```

leaves you in Home Bank and represents another form of enable.)

`Get_Bank_Number` will tell you what bank is enabled for the address in HL. The bank number comes back in A, in case you need to know what bank is active for a particular address. `Get_Bank_Status` gets the horizontal select byte into C for the Bank whose number you give it in B. `Get_Chunk` returns a mask in A with the bit set for the chunk containing the address in HL.

Interbank Calls & Jumps

`Call Bank` is another high-level routine that allows you to call routines in another bank, pass a number of parameters on the machine stack and to return as from an ordinary call, and have some other number of parameters returned on the machine stack. For example, you might be calling complex cartridge routines from RAM in Home bank. The parameters to be passed go on and come back on the machine stack. These parameters are described by their byte count. The called routine must know how many parameters to expect on the stack, since that information is not passed by the `Call Bank` routine. The number of parameters expected back can be found on the bank-switching stack at FD8A or 65CA.

A small error, corrected in the tech manual, caused `Call Bank` to crash if you wanted to pass parameters. Once it works, the way to use this routine is as follows:

1. Push the values you want to pass onto the machine stack. The number of bytes you push is called `PRM_OUT`.
2. Push the address of the routine you want to call, followed by the bank number (high byte) and the horizontal select (low byte) that will enable the code for the call.
3. Then push the 16-bit number that equals `PRM_OUT`. This number should not be larger than about 0180H (384d) or you will cause the machine stack to overflow its normal limit.
4. Push another 16-bit number, `PRM_IN`, that is the number of bytes you expect back from the called routine. (If the called routine does not for some reason return the correct number of bytes, you will crash.)
5. Next, call `Call Bank`.
6. Finally, pop off the parameters expected back from the called routine. It is the responsibility of the called routine to get the right number of parameters off the stack and return the specified number of bytes. Pop off only `PRM_IN` bytes, as the rest of the stack is managed by the `Call Bank` service routine.

If you pass no parameters, then push two words of zeroes for steps 3 and 4, and skip step 6.

A couple of middle-level routines, `Save_Bank_Status` and `Restore_Status`, can be useful to get you back to wherever you started switching banks. The first gets the status of every bank and writes it in a byte per bank to the address pointed to by IX and above. The `Restore` reads the status bytes and enables the originally active chunks. These are really subroutines that require the caller to manage the value in IX. The 2068 routines generally have IX pointing to a gap in the stack, but you can use it as a simple pointer to a storage area.

There is one very important thing that you will need in order to properly access the extra memory. That is a corrected EXROM. Ray Kingsley has an eprom that replaces the EXROM and allows for the use of the function dispatcher the way it was originally intended. It is available from him for the cost of the eprom + burning time. \$16.00. PO Box 8032, Santa Fe. NM 87504

John Oliger
11601 Whidbey Dr.
Cumberland, IN 46229

The following circuit will allow you to use the memory area above the EXROM, which occupies the 0 to 8K chunk in that memory bank, as RAM.

RAM-Resident Code Addresses

Function dispatch	6200	F9C0
INT (for RST 38H)	62AE	FA6E
INT NMI	6307	FAC7
GET_WORD	6316	FAD6
PUT_WORD	633B	FAFB
WRITE_BANK_STATUS_REG	635C	FB1C
READ_BANK_STATUS_REG	63AD	FB6D
GET_BANK_STATUS	6405	FB5C
GET_CHUNK	644D	FC0D
GET_BANK_NUMBER	645E	FC1E
BANK_ENABLE	6499	FC59
SAVE_STATUS	651E	FCDE
RESTORE_STATUS	654A	FD0A
GOTO_BANK	6572	FD32
CALL_BANK	65D0	FD90
XFER_BYTES	6722	FEE2
GOEX	6815	FFD5

The high addresses occur when you are using any video mode but the default (32-column).

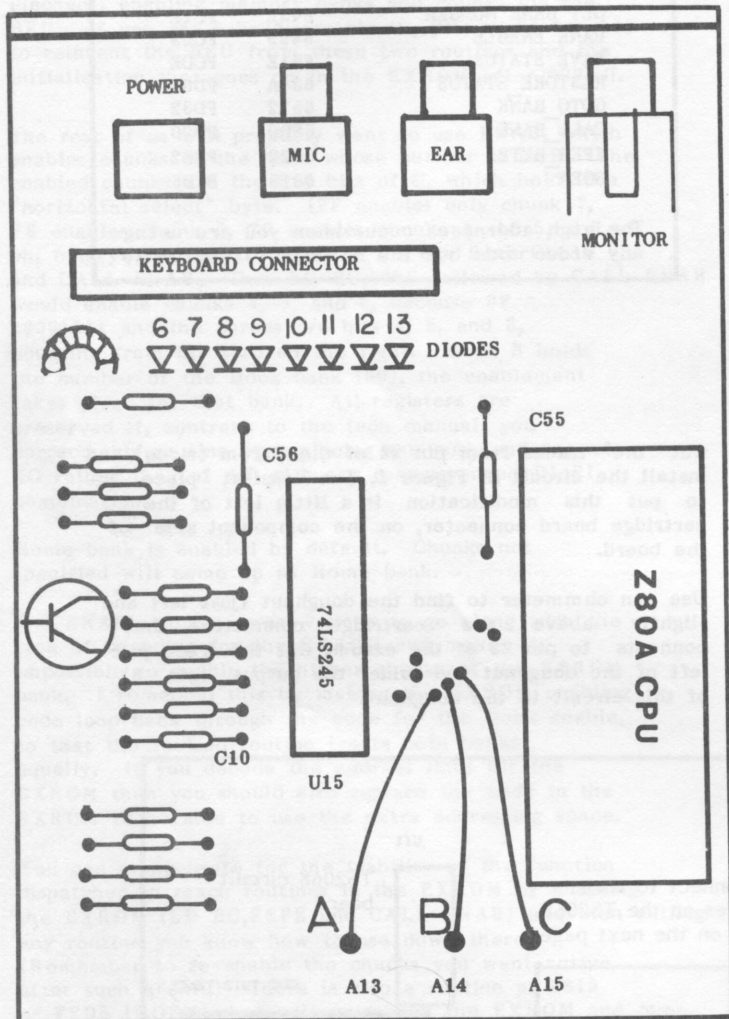
Cut the traces from pin 22 of the Exrom (mreq) and install the circuit in Figure 1. The easiest place to put this modification is a little left of the cartridge board connector, on the component side of the board.

Use an ohmmeter to find the doughnut (just left and slightly above the cartridge connector) that connects to pin 22 of the exrom. Cut the trace just left of the doughnut and solder the output (pin 8) of this circuit to the doughnut.



Solder pin 9 to the other side of the cut. Just left of the 16K ROM, below the 64 pin ULA chip and to the right of the Z80 chip, you will find two blue zero ohm resistors (jumpers) with single black stripes marked W1 and W2. The left side of W1 is an easy place to make this solder connection for pin 9.

A13 = Z80 pin 3
A14 = Z80 pin 4
A15 = Z80 pin 5
mreq = Z80 pin 19



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Converting the Oliger 64K Ram for the 2068

John Oliger

To use the JLO 64K RAM board (from the TS1000) on the 2068, it is necessary to make the following changes:

1. Remove the feedthrough at pin 5 of U5 (74LS138).
2. Remove the feedthrough just above the edge trace that is furthest to the right on the component side of the board. (This is below and to the right of R3-2.7KOhm.)
3. Remove the feedthrough just above and to the right of R1 (2.7KOhm), which is in the middle of the board. (This is the same feedthrough that is removed for using machine code above 48K and the Video upgrade.)
4. Remove the feedthrough above U5 and just to the right of the 48/64K legend. This is the ROM CS not trace.
5. If you are adding memory to the EXROM bank then skip step six and continue with seven.
6. For decoding in the ros (cartridge) bank and the use of the first 8K chunk (0 to 8K) is desired, then jumper pin 15 of U5 to the anode of diodes D3 to D6 with a 1N4148 diode. Connect the cathode of that diode to pin 15 of U5.
7. Set the Bank A/B switch to its OPEN state, 8 to 12K and 12 to 16K switches on and the 48 to 64K switch on.
8. Jumper pin 5 of U5 to either EXROM not (trace 27A - on the bottom of the 2068 expansion port) or the ROSCS not (trace 28A - the next one over on the expansion port of the 2068).

BASIL'S COMPENDIUM

John (Basil) Wentworth
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Bloomington, IN 47401

Where to Put the Program

This chapter will list some requirements for the place where we will put the machine code, and will show you how to find a memory location that meets those requirements. But first, our "play by ear" utility program.

The "rough draft" 1 REM line and the proofreading program are shown in Figures 3-1 and 3-2, respectively, and the readout for proofreading is in Figure 3-3. After you POKE the vacancies, according to Figure 3-4, the final proofreading should checkout with Figure 3-5.

I know that's awfully fast, but it's just a repeat of what you have done in the previous chapters. If you're still having a problem with this procedure, then get in touch with me directly. I'll be glad to be of service.

When you have the final 1 REM line in place, add the following two lines to your program:

```
1000 PRINT AT 10,3;"BASIL LOVES  
JOCELYN"  
1010 RAND USR 16514
```

Then, GOTO 1000 and watch the fun.

And now the lesson.

What We Need

Where in ram are we going to store our machine code? We must satisfy two conditions.

1. The machine code routine must not interfere with the normal running of the computer itself.
2. The running of the computer must not interfere with the machine code.

Live and let live. For convenience, we'd like to impose a few more conditions, including:

3. The program should be easily entered, proofread and edited.
4. It should be possible to SAVE the program.
5. It should be expandable. We should be able to add more subroutines as they become necessary.

For the moment, let's shelve number 5, and concentrate on the first four conditions. We'll get back to number 5 later on.

Recall that the USR command must specify the starting address of the machine code routine. Much as GOTO and GOSUB have to be followed by a number

(or an expression which the computer can evaluate as a number), so does the USR command require a number or expression equal to a number. This means that we'll have to know (or compute) the address of the first byte of machine code every time we want to invoke it.

"What do you mean, every time?" I hear you cry. "Doesn't my code stay put?" Well, that depends. Let's try a little experiment.

Suppose your program consists of a line of 27's. It never will, of course, but 27 is the code of a character that's easy to spot (pardon the pun; try PRINT CHR\$ 27). Let's put a line of 27's into the computer. Try this:

10.....

OOPS! The computer won't accept it. So, let's give in to the computer on this point, and use up an extra byte. Try:

10 REM

If you're really vindictive, POKE 16513,27. GOTCHA! There's that line that the computer wouldn't accept. Don't ever try to EDIT that line. It's much easier to include the REM. It takes up only one extra byte, doesn't get in the way and makes things much easier all around (like salvaging the program if you ever inadvertently get the line down into the edit position).

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So, now you have,

10 REM

Let's see what the memory contents look like. Use the program of Figure 3-6. See those 27's starting at 16514? Now add another line:

1 REM

Run the program again. The 27's have moved up to memory locations starting at 16520! Change line 1 to:

1 REM ABC

Run the program again and notice that the 27's have moved once again. Well, it's going to be pretty hard to find a starting address that keeps moving around, but don't give up.

Let's try something else. Delete line 1 and Run the program again. Not surprisingly, the 27's are back at 16514. Now, change the number of the REM from 10 to 1. Run it again. Notice that there is no change in the location of the 27's. Now, add:

10 REM ABC

Run the program again and notice that there is still no change in position of the 27's.

And here's the conclusion that we draw from this maneuvering:

The address of the first byte in the first statement of the program does not depend on the line number of that statement, nor is it changed by the addition of any program lines numbered higher than the first line.

So, what are you to do? Put your machine code in a 1 REM, and the first byte after the REM will always have the same address, namely 16514, unless of course, you put a 0 REM in front of it. (We're going to show you how and why to use line 0 one of these days.)

Ok, now let's do something stupid, just to demonstrate a point. Don't worry, it won't do any harm, other than to crash (guaranteed) the program in memory. So, if you have any program material that you care about, SAVE it now, before continuing.

Ready? Enter the line

1 REM

and then POKE 16514,27. Now, LIST the program.

Don't say that I didn't warn you. It's an interesting picture, but it's not the sort of program you want to use every day. You can't even get rid of it without turning off the computer.

What happened? Well, the computer was using 16514 for one of those "housekeeping" bytes (end of line marker), and was thrown off balance when you asked it to something else with that byte.

What we have to do is lay claim to some space for our machine code, and to do it before the computer starts using that space for its own purposes. The

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way we do this is to fill all the bytes we need after the REM with characters of our own choosing. There are various ways to accomplish this (see SWN 2/2, Memotext in ram or the article by Chuck Peterson on generating a big REM).

Enough preliminaries. Next time, we'll actually write a real (though simple) program in machine code.

FIGURE 3-1. 1 REM for BLACKTOP
-FIRST DRAFT-

HOW IT LOOKS

```
1 REM CHR$ "E' RNDY.W7C.Y".  
"4.TAN
```

HOW IT IS DONE

```
1 REM (GR 1) CHR$ (GR 2) E (S  
HIFT SPACE) RND Y W 7 (INVERSE  
Y) C Y (INVERSE SPACE) (GR Y)  
" 4 . TAN
```


FIGURE 3-2. THE RUDIMENTARY LOADER

```

1000 REM PROOFREADING THE PROGRA
M
1020 FOR F=16514 TO 16534
1030 PRINT F;TAB 6;PEEK F;TAB 10
;CHR# PEEK F
1040 NEXT F
1050 STOP
1500 REM POKING THE VACANCIES
1510 INPUT A
1520 PRINT A;TAB 6;
1525 LET A=A+16500
1530 INPUT B
1540 POKE A,B
1550 PRINT PEEK A
1560 GOTO 1510

```

FIGURE 3-3. PROOFREADING THE PROVISIONAL 1 REM

```

16514 1  CHR#
16515 214  CHR#
16516 2
16517 42  E
16518 12
16519 64  RND
16520 62  Y
16521 27
16522 60  W
16523 35  7
16524 190  C
16525 40  C
16526 27  Y
16527 62  Y
16528 128
16529 134
16530 27  .
16531 11  .
16532 32  4
16533 27
16534 201 TAN

```

FIGURE 3-4. POKING THE VACANCIES

```

21 117
25 252
30 119
33 242

```

FIGURE 3-5. PROOFREADING THE FINAL 1 REM

```

16514 1  LD BC,
16515 214  CHR# 726
16516 2
16517 42  LD HL,
16518 12  (16396)
16519 64  RND
16520 62  LD A,
16521 117  117
16522 60  INC A
16523 35  INC HL
16524 190  CP (HL)
16525 40  JR Z,
16526 252  UNPLOT -4
16527 62  LD A,
16528 128  128
16529 134  ADD A,(HL)
16530 119  LD (HL), A
16531 11  DEC BC
16532 32  4 JR NZ,
16533 242  PAUSE -14
16534 201 TAN RET

```

FIGURE 3-6. WHERE ARE THE 27'S?

```

10 REM .....
100 FOR M=16509 TO 16530
110 PRINT M;" ";PEEK M
120 NEXT M

```

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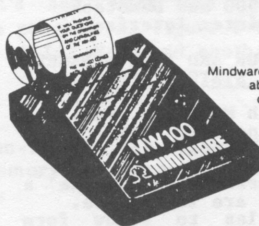
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